This is author version of article published as:
Partridge, Helen L. (2007) Redefining the digital divide in the 'smart state'. In *Proceedings 13th Australiasian World Wide Web Conference*, Coffs Harbour, NSW.

Redefining the digital divide in the 'smart state'

Helen Partridge [HREF1]
Faculty of Information Technology
Queensland University of Technology
2 George St., Brisbane, Queensland, Australia, 4000.
h.partridge@qut.edu.au

ABSTRACT
This paper will present a research project that explores the psychological factors that prevent people within community from integrating information and communication technology (ICT) into their lives. The research will use Bandura's social cognitive theory to examine the psychology of the digital divide. Participants in the study are members of the Brisbane community. Self administered surveys are used for data collection. The research has both theoretical and practical significance. It establishes a way of thinking about and understanding digital inequality in community that goes beyond just simple physical access to ICT. The research provides evidence that the characteristics or make up of the digital divide is more complex than the current socio-economic understanding of the phenomenon. The research illustrates that psychology does matter, and that the digital divide involves both more members of the population and different members of the population then current research has shown to date. The digital divide is not about computers, modems, the internet and hardware. It is about people. As such the key to solving the issue of digital inequality is not going to be found with corporate or government funds providing physical access to technology. Instead, the key to solving digital inequality is inside the individual person.

INTRODUCTION
The digital divide between Information and Communication Technology (ICT) 'haves' and 'have-nots' has been a topic of considerable discussion since the US federal government released its 1995 report on household access to technologies such as the telephone, computers and the Internet (NTIA, 1995). Since this time many organizations have endeavoured to bridge the digital divide through a diverse range of initiatives and projects, and government agencies have established and implemented public policy aimed at closing the divide. These initiatives and projects have been developed based on the current understanding of the digital divide. The study was conducted in the Australian 'smart state' of Queensland [see note 1 at end of paper]. This understanding has been developed primarily from a socio-economic perspective. According to current studies (e.g. NOIE, 2005) the primary factors contributing to the digital divide are income, employment and education. As personal computer prices have fallen and internet services to the household are becoming increasingly less expensive the socio-economic perspective of the digital divide becomes less convincing to explain all reasons for ICT non-use. The 1999 study by the National Telecommunications and Information Administration (NTIA) into the digital divide in the Unites States suggested that the “don’t want it” attitude is fast rivalling cost as a factor explaining non-use of the Internet. Recent criticism of the current digital divide studies (Jung, Qiu & Kim, 2001) has suggested that the studies fail to consider the psychological, social and cultural barriers to the digital divide. Consequently current research portrays the digital divide as a relatively simple premise: the digital divide is a dichotomous concept – you either have access to ICT or you don’t - and this access is determined by socio-economic factors. In truth the digital divide is far more complex and evolved. If all members of community are to be allowed to become active citizens and if community organisations are to develop services and resources that will contribute to bridging the digital divide efforts must be made to more clearly understand the social, psychological and cultural differences that contribute to its development. This paper discusses a research project into the psychological barriers of the digital divide. The paper is divided into three parts. Part one considers what the digital divide is. A brief picture of the digital inequality in Australia is outlined. The limitations of current digital divide studies are discussed. Part two outlines the research project. The research

approach, the underlying theoretical framework and the final results are outlined. Part three will discuss the future and emerging trends of digital divide research, suggesting further opportunities for study and exploration.

A REVIEW OF THE LITERATURE

The phrase *digital divide* has become the accepted manner for referring to "the social implication of unequal access of some sectors of community to Information and Communication Technology [ICT] and the acquisition of necessary skills" (Foster, 2000, p. 445). The term has been derived from the commonly held belief that access to Information and Communication Technology (ICT) such as the Internet, and the ability to use this technology is necessary for members of community if they are to fully participate in economic, political and social life. Studies examining the digital divide abound. In Australia the National Office for the Information Economy (NOIE) and the Australian Bureau of Statistics (ABS) have been the main bodies engaged in quantifying or measuring the digital divide. Whilst the NOIE and ABS studies are focused more on exploring "Australia's progress in the emerging information economy" (NOIE, 2002, p. 4) and do not identify themselves as being "digital divide" research per se, they nonetheless provide a profile of digital inequality within the Australian community. These studies have suggested that the primary factors contributing to the digital inequality are race, gender, geography, age, income, education, disability, employment, and household structure. Individuals who can be identified through these factors are more likely to represent the 'have-nots' in the digital divide.

The NOIE and ABS studies have been an invaluable starting point for developing knowledge of the digital divide within Australia. The studies have clearly shown how a range of socio-economic factors have, over the years, separated those who have access to IT, such as the internet, and those who do not have access. From this perspective "the digital divide is easily defined and as a result easily closed, bridged and overcome" (Selwyn, 2004, p. 345). Burgelman (2000) suggests that this portrayal of the digital divide is "simplistic, formalistic and thus idealistic" (p. 56). This simplistic view of the digital divide has arisen because the studies have taken a narrow definition of the digital divide and used empirical measures that are 'rather basic'. Neice (1998) notes that the measures used in digital divide research have "been developed mainly for market research, advocacy or public policy purposes" (p. 4). and are therefore of questionable relevance in any form of research that seeks to establish a sophisticated understanding of the phenomenon. This point was also noted by Jung, Qui and Kim (2001) when they observed that the current studies exploring the digital divide are limited by their focus on three primary measuring techniques. These techniques include: a dichotomous comparison which focuses on the issue of simple access or ownership (i.e. computer owner vs. non-owner); a time based measure, where more time spent online is equated to "regular use"; and a measure of activities conducted online, where frequency of engaging in activities such as online banking and online shopping are measured. Jung, Qiu and Kim (2001) contend that these measures fail to consider the social context in which people incorporate technology. The personal and social effects of the internet must be considered in comprehending the more subtle aspects of the digital divide. They conclude "existing inequalities even after gaining [physical] access to the internet can directly affect the capacity and the desire of people to utilize their connections for purposes of social mobility" (Jung, Qiu & Kim, 2001, p. 8).

The need to focus on the personal and social aspects within digital divide research was also proposed by Selwyn (2004): "people's non-use of technologies is a complex, fluid and ambiguous issue" (p. 352) and that "despite the high profile nature of the digital divide debate, academic understanding of who is making little or no use of information and communication technologies (ICTs) remains weak" (p. 352). At present the digital divide research has concentrated on describing the "characteristics of those who are using ICTs or, at best simply pathologised the 'have nots' in terms of individual deficits" (Selwyn, 2004, p. 355). Selwyn (2004) suggests that an individual's interactions with ICT is not as simple as the 'user'/'non-user' dichotomy applied within much of the digital divide research. He supports Frissen's (2000) view that "knowledge of the dynamics of everyday life is indispensable to understanding the processes of acceptance of ICTs" (2004, p. 356). Thus, according to Selwyn (2004), when "focusing on non- and low-use of technologies we must begin to

recognize the importance of the social" (p. 355). Selwyn (2004) points to the work of Brulan who noted that resistance to technology is by no means irrational or conservative and "can only be understood in terms of the interaction between technology and its social context" (p. 355)

What Selwyn (2004) and others are suggesting is that the digital divide is not a "relatively simple premise"; rather it is a complex issue that has many facets and sides including personal and social elements that must be considered. Existing digital divide studies have not taken these elements into full examination. This point was raised also by Vernon Harper (n.d.). In a recent discussion paper Harper (n.d) suggests that whilst the digital divide metaphor works it focuses too much attention on the divide as opposed to the divided. According to Harper the digital divide has been conceptualised as a hardware problem, which can be readily and easily solved when the barriers to access are removed. Harper (n.d) questions the legitimacy of this perspective and proposes that in reality there are two digital divides: access digital divide (ADD) and social digital divide (SDD). The ADD is based upon cost factors and is frequently discussed in terms of the presence of computers or internet access in the household. The SDD is "a product of differences that are based on perception, culture and interpersonal relationships that contribute to the gap in computer and internet penetration" (Harper, n.d, p. 4). It is composed of barriers to motivation, knowledge, skill, content and social networks. Harper (n.d) concludes by stating "the issues surrounding the digital divide must be redefined away from the hardware and towards humanity" (p. 5). Harper (n.d) recommends that the scholarly community build research that explores the social, psychological and cultural differences that contribute to the SDD. In recent years a small but growing number of studies have begun to meet Harpers' challenge by exploring the digital divide from different perspectives including education, cultural and sociological (Kvasny, 2002; Mossberger, Tolbert & Stansbury, 2003). In 2002 Cuneo noted that there has been too little to no research exploring the digital divide from a psychological perspective. Cuneo (2002) concluded that "there is an underlying psychological dimension to the digital divide that is complex and little understood; it deserves much more careful and extensive research" (p. 27). Cuneo is not the first scholar to comment on the lack of research exploring the psychological aspects of digital inequality in community. This point was also recently noted by Van Dijk (2005) who observed that there is a preponderance of sociological and economic research but that contributions from psychology and even from communication and education studies are relatively small. Van Dijk (2005) concludes that the digital divide cannot be understood without addressing issues such as attitudes toward technology, technophobia or computer anxiety, communication in new media diffusion, educational views of digital skills and cultural analysis of daily usage patterns. This current research will help the gap in studies exploring the digital divide from the psychological perspective. The research will add to the growing body of knowledge on the digital divide.

To date, only four studies have attempted to explore the digital divide from a psychological perspective. All four studies have used Bandura's social cognitive theory. This theory postulates that a person will act according to their perceived capabilities and the anticipated consequences of their actions. Self-efficacy is the primary component of the theory. It is the belief that a person has that they can perform a particular behaviour or task. Three of the studies were conducted in the US (Eastin & LaRose, 2000; Foster, 2001; Ringgold, 2001) and involved high school and college students and their use of computers and the internet. Two of these studies focused specifically on the experience of African American students as compared to European American (i.e. white American) students. One study was conducted in Hong Kong (Lam & Lee, 2005) with older adults and their use of the same technology. All four studies have helped to expand current understanding of the psychological factors that impact upon a person's willingness to engage with ICT. The studies provide initial support for an alternative psychological perspective to the current socio-economic understanding of the digital divide. However, these studies are limited in three significant ways: firstly, the participants used (i.e. college students, African American students, senior citizens) in the studies resulted in limited generalisability to other populations; and notably only one of the studies used participants drawn from the general population; secondly, none of the studies included both socio-economic and socio-cognitive factors; and thirdly, none of the studies were conducted in Australia. The current research will fill these gaps; and in so doing add to the growing body of knowledge on the digital divide per se, and on the application of the socio-cognitive framework to understanding the digital divide in particular.The Social

Cognitive Theory (and specifically self efficacy) provides a new way of viewing digital inequality. This perspective will help understand why individuals with high socio economic status are choosing to not or rarely use ICT and why those individuals with low socio economic status are choosing to use ICT. It will also provide a new way of looking at the 'have-nots' and 'haves' as identified by the existing socio-economic study. The argument presented here is that the socio-economic view of the digital divide only tells one part of the story, by including a human centred perspective – that is a perspective that looks at the internal forces influencing an individual's behavioural decisions – a new way of understanding digital inequality emerges.

THE RESEARCH PROJECT

Research Question

This study will use the research hierarchy proposed by Cooper and Emory (1995). The research hierarchy consists of (i) the management question, (ii) research questions; (iii) investigative questions and (iv) measurement questions. Whilst this hierarchy was developed as a guide for research being conducted within business contexts specifically, the hierarchy offers a sound and systematic approach to the research process that is applicable in non-business contexts (i.e. community contexts). Figure 1.1 summarises how the research hierarchy was used to derive the research questions for the current study. According to Cooper and Emory (1995) the management question is the problem or question prompting the research. They warn that a "poorly defined management problem or question will misdirect research efforts" (1995, p. 56). The management question driving this study is: *How can the current socio-economic understanding of the digital divide be improved by including a psychological or human perspective?* Once the management question has been identified Cooper and Emory (1995) recommend establishing a research question that is "a fact oriented information gathering question" (1995, p. 57); it represents the general purpose of the study. The research question that follows from the above managerial question is: *What influence do socio-cognitive factors have in predicting internet use by members of the general population when the effects of socio-economic factors are controlled?* The investigative questions "guide the development of the research direction" (1995, p. 58). These questions serve the purpose of breaking down the research question into more specific questions about which we need to gather data. The investigative questions that follow from the research questions stated above are: (i) *How can the socio-cognitive factors be operationalised?* (ii) *How can the socio-economic factors be operationalised?*; (iii) *How can internet use be operationalised*; and (iv) *What is the relative importance of these socio-cognitive and socio-economic factors in predicting internet use?* Measurement questions constitute the fourth and last level of questions within the Cooper and Emory (1995) research hierarchy. They are the questions on which the actual set of data is collected (i.e. questions within surveys and interviews). Further details on the measurement questions used in the current study are provided below.

Theoretical Framework

This research will examine the internal or psychological forces that motivate an individual to refrain from integrating technology, such as the Internet, into their lives. To achieve this end the research will use the social cognitive theory (SCT) developed by Albert Bandura (1986). This theory asserts that behaviour is best understood in terms of a *triadic reciprocality* (Bandura, 1986). Where behaviour, personal factors and the environment exist in a reciprocal relationship and are thereby influenced or are determined by each other. According to Bandura individuals are actively involved in shaping their environments and not merely passive reactors to them (Bandura, 1986). This relationship is shown in Figure 1.

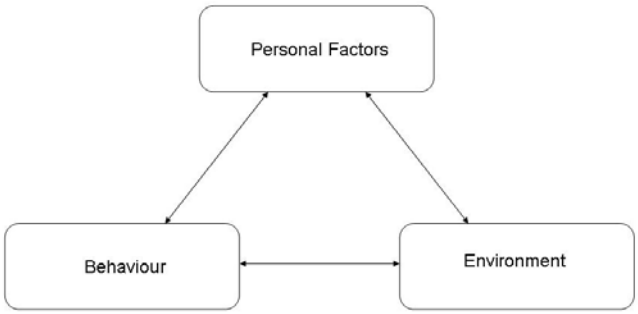

Figure 1: The triadic relationship (Bandura, 1986)

SCT has two key constructs: self efficacy and outcome expectancy. Self efficacy refers to a person's judgement of perceived capability for performing a task, and outcome expectancy refers to a person's belief that performing a task will lead to a specific outcome. Self efficacy is the more important of the two constructs in determining behaviour. Self-efficacy has three dimensions: magnitude, strength and generality (Bandura, 1986). *Self-efficacy magnitude* refers to the level of difficulty a person believes they are capable of performing. *Self-efficacy strength* refers to the level of conviction a person's has that they can perform a task or behaviour. *Self-efficacy generality* refers to the extent to which a persons success or failure in a task or behaviour will influence their self-efficacy in other tasks or behaviours. According to Bandura (1986) individuals acquire information about their personal Self-Efficacy from six primary sources: (a) actual experiences, (b) vicarious experiences, (c) verbal persuasion, (d) physiological states, (e) imaginal experiences and (f) distal and proximal sources. An individual's own performances, especially past successes and failures, offer the most reliable source for assessing self-efficacy (Bandura, 1986).

Research Context

The research was conducted in Brisbane, Australia. Data collection took place using a number of different contexts including, the Brisbane city public library service, the Accor Hotel chain staff, students from Southbank TAFE, gyms, parent groups and individuals using public transport. An effort was made to obtain participants from a diverse range of Brisbane suburbs representing diverse socio-economic area, including Inala, Mt Gravatt, Indooroopily, Carindale, Rocklea and Greenslopes.

Research Approach

Self administered survey instruments were used for data collection. Final data collection was conducted in November through to December 2005. Because of the short period for data collection (8 weeks) three research assistants were involved in the collection process. To control for variation in the data gathering process a standardized procedure for data collection was established.

Measures

The survey instrument gathered data on (i) socio-economic factors; (ii) internet use; and (iii) socio-cognitive factors.

Socio-economic factors

Existing research exploring the digital divide in the Australia have offered a number of different factors that are suggested to impact on digital inequality. Whilst the importance of factors may have varied from year to year in general the factors were: income, employment, gender, age, disability, ethnicity, geography and household type. To allow the current research to build upon these studies the following socio-economic variables were included: gender, age, income, education, employment, disability and ethnicity. As the research is based on metropolitan cities geography was not included. Household type was not included as it was used in varying ways in the studies, and more often than not household type referred to average household income and education and as such does not add to the data already being obtained by existing income and education variables. Additionally the current

research was focused on the individual not the family. Because existing studies focused on each variable's unique contribution to the digital divide the variables were not combined into one all purpose measure of socio-economic status.

Internet use

The measure used in the current research was based upon an existing measure of internet use by LaRose, Mastro and Eastin (2001). An additive index of two items was used. Participants were asked to indicate their degree of internet use on a five point scale (i.e. 1 if none, 2 if less than an hour, 3 if 1 to 2 hours, 4 for more than 2 and up to 5 hours, and 5 if more than 5 hours). Respondent's scores could range from 2 to 10. The higher the score obtained the more a respondent uses the internet.

Socio-cognitive factors

Two socio-economic variables were used in the study: internet self efficacy and internet outcome expectancy.

An internet self efficacy scale was developed and validated for use in the research The self report scale is a measure of an individual's perceived self efficacy for using the internet (eg. 'View a multimedia (audio or visual) file'). The four step approach for scale development proposed by Netemeyer, Bearden and Sharma (2003) was used in developing the scale for the research. In addition, Bandura's well established protocol for developing self efficacy scales was followed (Bandura, 2005). The scale is available from the author by request. An initial pool of 67 items was generated. Existing internet self efficacy and computer self efficacy scales provided guidance on what to do and what not to do. It should be noted that the internet self efficacy scale was developed for the current research after pilot test of three other internet self efficacy scales revealed that the scales were not 'written at the reading level of the participant" (2005, p. 4). The scales tested were all developed using US college students. Two expert panels were then invited to provide comment on the items. One panel consisted of six experts in the area of internet use. The other panel consisted of five experts in the area of self efficacy. The panel members were invited to provide comment on the item pool based on their area of expertise. Expert review was also obtained through the presentation of a poster at the American Psychological Society Annual convention in 2003. A total of 40 items was finalised after consulting with the expert groups. Exploratory factor analysis was used to establish the psychometric soundness of the scale. A one factor solution was identified. Participants respond to the 24 item scale by indicating how confident they are they can do the internet tasks listed on a scale ranging from I am not at all confident (0) to I am moderately confident (5), to I am totally confident (10). Scores could range from 0 to 240. The higher the score obtained the more an individual is characterised by high perceived internet self efficacy. High internal consistency was noted with Cronbach alpha of .97.

Six measures of internet outcome expectancy developed by LaRose, Mastro and Eastin (2001) were used in the study. These include (i) a four-item Activity Outcomes Scale measuring the likelihood of finding enjoyable activities on the internet (eg. "feel entertained'); (ii) a four-item Novel Sensory Outcome scale that assesses the likelihood of finding information on the internet (eg. 'get immediate knowledge of big events'); (iii) a four-item Social Outcomes scale that assesses the likelihood of developing relationships over the internet (eg 'get support from others'); (iv) a three-item Self Evaluative Outcomes scale that measures the likelihood of finding entertainment over the internet (eg. 'relieve boredom'); (v) a four-item Status Outcomes scale that measuring the likelihood of obtaining improvements in life (eg. 'improve my future prospects in life"); and (iv) a four-item Monetary Outcomes (.88) scales that measures the likelihood of saving money on the internet (eg 'get products for free'). Respondents indicate the likelihood of each internet outcomes using a Likert scale ranging from Extremely Unlikely (1) to Extremely Likely (7). The higher the score the higher obtained on each scale the more an individual finds the outcome to be likely. This is the first time that theses scales have been used with members of the general population (the scales were developed using US college students). Interestingly the six scales or dimensions did not emerge from the current research. Exploratory factor analysis revealed that a one factor solution offered the simplest structure. Internal consistency was sound with Cronbach alpha of .88.

Further evidence of the construct validity of the internet self efficacy scale and the outcome expectancy scale can be found by examining the inter-scale correlations. Pearson-Product moment correlation coefficient revealed a low to medium positive correlations between the two scales (r=.361, n375, p<01) with high levels of self efficacy associated with high levels of outcome expectancy. Bandura (1986) notes that self efficacy and outcome expectancy are two related concepts and as such a significant relationship would be expected between the two scales.

Participants

433 participants were involved in the study. Due to instances of missing data several questionnaires could not be used in the research. Complete data was obtained for 389 of the participants [see note 2 at end of paper]. Of these participants 245 were female and 144 were male, aged 17 to 80 with a modal age range of 31-40. There is good sample coverage with the current sample's characteristics similar to the Brisbane community in general. Using the 2001 ABS census [see note 3] it was noted that the only minor differences between the current study's sample and the Brisbane community is that people with higher education, people with lower incomes and those unemployed and those identifying themselves as Australian Aboriginal and Torres Strait Islanders are slightly over represented. This may be the result of the data collection contexts used in the study providing access to a specific section of community. Nonetheless statistical analysis can proceed confident that the study sample if a close representation of the population being explored.

RESULTS

Hierarchical regression analysis was used for data analysis. Analysis was undertaken using SPSS. Prior to data analysis the data was examined for accuracy of data entry and fit with assumptions such as sample size, multicollinearity and singularity, outliers and normality, linearity and homoscedasticity. One case was removed as an outlier; leaving 388 valid cases for analysis. A two step analysis was conducted. In Step 1 the socio-economic variables were entered. In Step 2 the socio-cognitive variables were entered. Because multiple regression requires metric independent variables dummy coding was used to convert non metric variables into metric variables. In the current research the seven socio-economic variables are converted to metric variables using indicator coding. For example, Age was converted to 0= 40 years and younger; 1=40 years and over. Table 1 provides the results of the analysis.

Independent Variables	Step 1	Step 2
Age	-.206**	-.027
Gender	.145*	.052
Income	.125*	.029
Employment	-.065	-.90
Education	-.084	-.033
Disability	.010	.011
Ethnicity	.185*	.073
Self efficacy		.603**
Outcome expectancy		.080
F Change	7.953**	28.500**
R2	.143	.444
Adj R2	.125	.429
R2 Change	.143	.302
Sig F Change	.000	.000
*p < .05 **p<.001		

Table 1: Hierarchical regression for internet use

At step one several of the socio-economic variables were significant predictors of internet use. These included in order of importance, age, ethnicity, gender and income. It appears that younger participants reported high levels of internet use (B=-.206, p <.05); those participants who identified themselves as not being of ethnic background reported high levels of internet use then those participants who identified themselves as having ethnic background (B=.185, p<.05); males reported higher levels of internet use than females (B=.145, p <.05); and participants with higher levels of income reported higher levels of internet use (B=.125, p<.05). After variables in block one are entered (all socio-economic) the overall model explains 14.3% of the variance.

At step two internet self efficacy was a significant positive predictor of internet use. Participants reporting higher levels of internet self efficacy (B=.603, p<.001) reported higher internet use. The socio-economic factors from step one were no longer significant predictors. An inspection of the R Square change value indicates that the second block of variables accounted for an additional 30.2% of the variance in internet use when socio-economic factors are controlled for. This is a statistically significant contribution as indicated by the F Change value [F(9, 333) =29.586, p<.001]. The final model accounted for 44.4% of the variance in internet use.

Thus, the regression analysis clearly suggests that when socio-economic factors are controlled for, socio-cognitive factors (more specifically self efficacy) have a positive prediction of internet use. Once again it is interesting to note that outcome expectancy was not a predictor of internet use. As with the US sample a second regression analysis was run with self efficacy as the dependent variable. This analysis was run to explore the impact, if any, that the socio-economic factors and the outcome expectancy factors may have on an individual's self efficacy.

The dataset was checked against the assumptions. Inspection of the normal probability plot justified no major deviation from normality. Inspection of the residual plot and subsequent calculations of Mahalanobis distance and Cook’s distance indicated that multivaricollinearity was not an issue. At step one the socio-demographic variables were not significant predictors of internet use. Although an examination of the standardized beta coefficients suggested that Age was a significant negative predictor of internet use (B = -.175, p<.05). This indicates that younger participants reported higher internet use than older participants. After variables in block one are entered (the socio-economic factors) the overall model explains 0.6% of the variance. This was not statistically significant.

At step 2. only internet self efficacy was a significant positive predictor of internet use. Participants reporting higher levels of internet self efficacy (b = .416, p<.001) reported higher internet use. The age factor was no longer significant predictor. An inspection of the R Square change value indicates that the second block of variables accounted for an additional 16.3% of the variance in internet use when socio-economic factors are controlled for. This is a statistically significant contribution as indicated by the F Change value [F(14, 282) = 4.582, p<.001]. The final model (with both blocks entered) explains 19.3% of the variance. Thus, the regression analysis clearly suggests that it is socio-cognitive factors (especially self efficacy) and not socio-economic factors that are positive predictors of internet use.
It is interesting to note that none of the outcome expectancy scales were predictors of internet use. This is perhaps not surprising given that Bandura noted that self efficacy was the core construct in social cognitive theory and that outcome expectancy is based largely on self efficacy beliefs and that on their own expected outcomes may not add much to the prediction of behaviour. But that outcome expectancy’s may contribute to the formation of self efficacy beliefs. To determine if this was the case in the current research a second regression analysis was run with self efficacy as the dependent variable. This analysis was run to explore the impact, if any, that the socio-economic factors and the outcome expectancy factors may have on an individual's self efficacy. The results of this analysis are presented in Table 2.

Independent Variables	Step 1	Step 2
Age	-.332**	.-.195**
Gender	.157*	.163*
Income	.155*	.146*
Employment	.064	.122*
Education	-.086	-.094
Disability	.023	-.009
Ethnicity	.194**	.211**
Outcome expectancy		.330**
Constant	16.245**	43.702**
F Change	.253	.340
R2	.238	.324
Adj R2	.253	.086
R2 Change	.000	.000
Sig F Change	-.332**	.-.195**
*p < .05 **p<.001		

Table 2: Hierarchical regression for internet self efficacy

The aim of this study was to examine the relationship between socio-economic factors and socio-cognitive factors on internet use by members of Brisbane community. Recent findings in the literature have suggested that socio-economic factors are the primary influencing on internet use and in understanding the digital divide. The current study found that this was not the case. Whilst socio-economic factors did not have statistically significant predictors on internet use when only considered by themselves; when socio-cognitive factors are also considered, it is internet self efficacy that is the only significant predictor. In short individuals with higher levels of internet self efficacy reported higher levels of internet use. Further analysis revealed that outcome expectancy, age, gender, income, ethnicity and employment were significant predictors of internet self efficacy. Taking into consideration the above findings three main observations can be drawn: Firstly, that Internet self efficacy is the strongest predictor, when compared with socio-economic factors, of internet use for member of the general public. Secondly, that socio-economic factors are not a predictor of internet use. And thirdly, age and education were significant predictors of internet self efficacy. The present research extended current knowledge of the major antecedents of internet use in community.

DISCUSSION

Existing research exploring the digital divide has tended to take a socio-economic focus. These studies have suggested that the primary factors contributing to the digital divide are income, employment, education, gender, age, ethnicity and disability. Individuals who can be identified through these factors are more likely to represent the ‘have-nots’ in the digital divide. Whilst these studies are useful in illustrating trends and suggesting possible relationships; and in placing the digital divide issue into the public spotlight and onto the government agenda, they are nonetheless limited by their narrow focus. A “socio-economic only” perspective does not provide a full portrait of the digital inequality in community. A graphical representation of the socio-economic framework of the digital divide is provided in Figure 2.

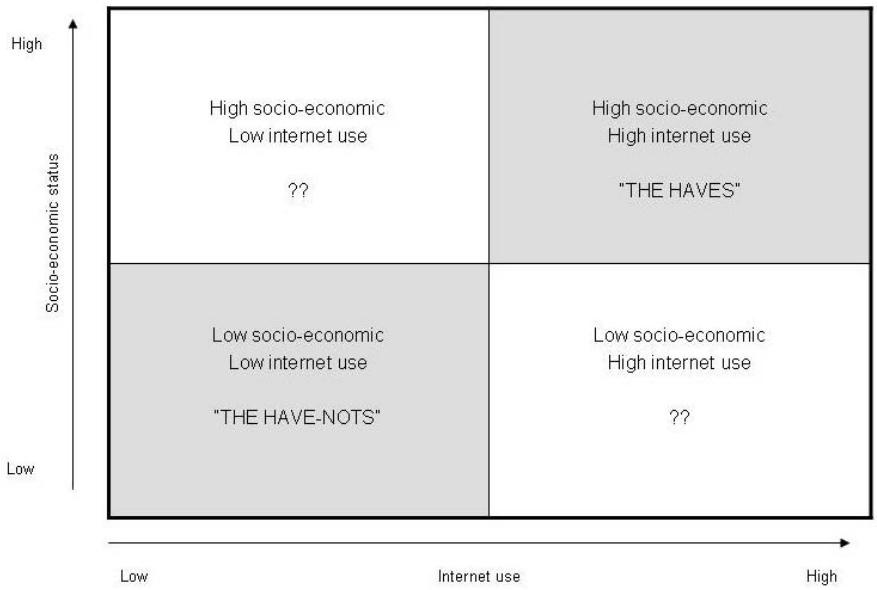

Figure 2: The socio-economic perspective to the digital divide

The current study seeks to build upon the existing socio-economic framework. The study explores a model of digital inequality in community that considers both socio-economic and socio-cognitive factors. The research is based on the premise that by combining both socio-economic and socio-cognitive factors, a richer more detailed and accurate picture of digital inequality can be established. A graphical representation of the combined socio-cognitive and socio-economic framework of the digital divide is provided in Figure 3.

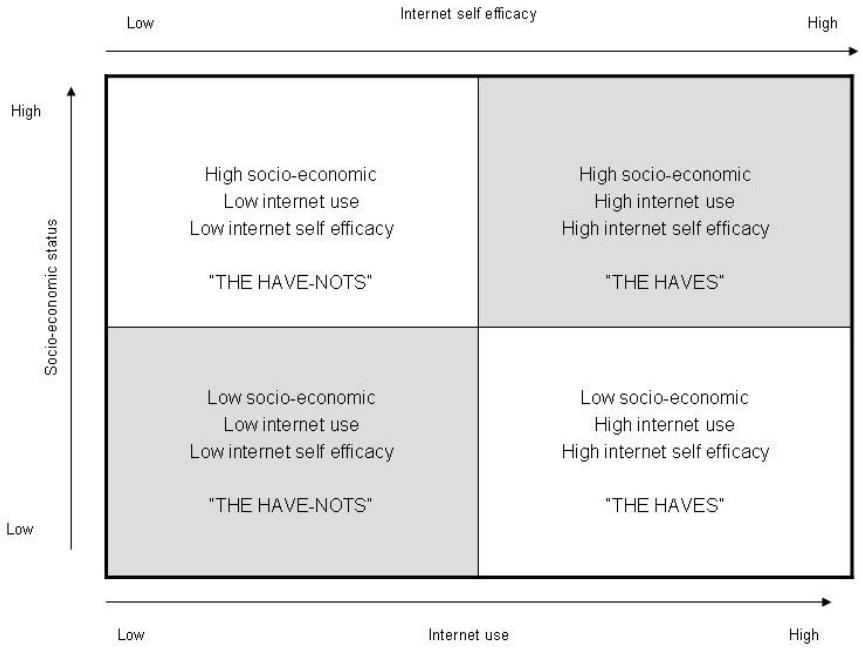

Figure 3: A combined socio-economic and socio-cognitive perspective to the digital divide

The results of the research, however, reveal that when considered together it is socio-cognitive factors – not socio-economic – that are the primary predictors of internet use in community. As such, a socio-cognitive framework of the digital divide provides the most accurate perspective for understanding the digital divide in community. A graphical representation of this framework is provided in Figure 4.

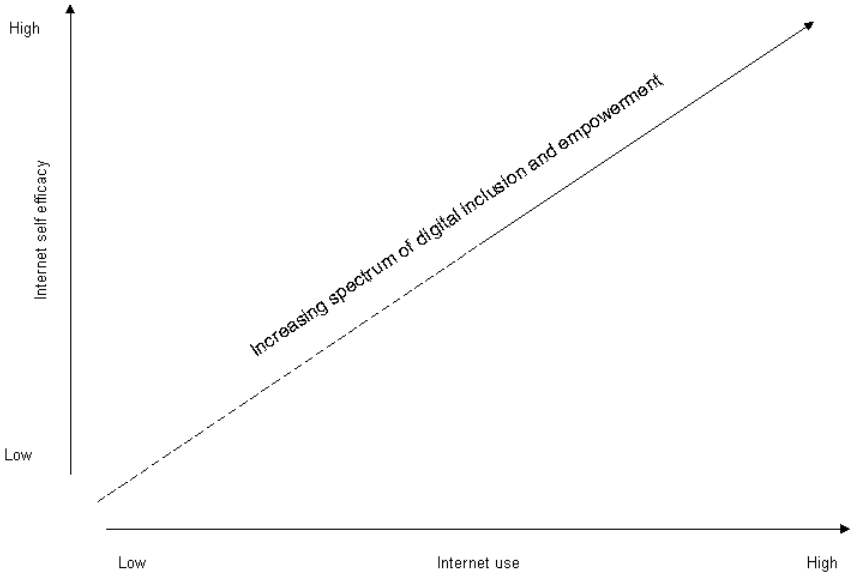

Figure 4: The socio-cognitive perspective to the digital divide

The proposed framework illustrates that digital inequality in community is far more complex and evolved than has been imagined. It also adds support to the argument that the “digital divide” phrase is simplistic and misleading. Digital inequality in community is more than just a “have” and “have-not” dichotomy of physical access to technology. With socio-economic factors such as income, employment and education the key elements in determining the division between the ‘haves’ and the ‘have-nots’. Instead the study proposes that digital inequality is about an increasing spectrum of digital inclusion and empowerment that is supported by people’s evolving level of self efficacy.

The research is significant because it is the first time that a study exploring the digital divide has combined both socio-economic and socio-cognitive factors in the research design; used members of the general population in the data collection process; and was conducted in Australia. The outcomes of this research influence our understanding of the digital divide in a number of ways. Firstly, it establishes a way of thinking about and understanding digital inequality in community that goes beyond just simple access to connection to technology. Secondly, the findings provide evidence that the characteristics or make up of the digital divide is more complex that the current dichotomous understanding. The socio-economic perspective that have dominated understanding of the digital divide to date, suggests that the lower an individual's socio-economic status the more likely they will represent the ‘have-nots’ in the digital divide; while the higher an individual's socio-economic status the more likely they are to represent the ‘haves’. Where a ‘have-not’ is someone who does not or rarely uses ICT such as computers or the internet and a ‘have’ is someone who regularly uses ICT. The socio-economic studies do not shed light on why those individuals with high socio economic status are choosing to not or rarely use ICT and why those individuals with low socio economic status are choosing to use ICT. This would suggest something else might be influencing people’s decision to engage with ICT in their lives. The current research illustrates that this something else is self efficacy. And that the digital divide involves both more members of the population and different members of the population then current research has shown to date. As such the current research has brought to light elements of the digital divide which have not being considered in contemporary discourse about the phenomenon.

The research illustrates that organisations (i.e. public libraries, community centres etc) aimed at supporting the information and ICT needs of community need to incorporate both physical access to technology and programs that help develop people self efficacy beliefs. Programs to develop self efficacy beliefs should include the four core sources of self efficacy noted by Bandura: enactive attainment; verbal persuasion; vicarious experience and physiological feedback. For example, enactive attainment provides the most authentic evidence of whether one can succeed in a task as such this is the most influential source for establishing self efficacy beliefs. Therefore it is important that opportunities for people to obtain access so they

may use the internet are maximised. Charging for internet access works against this strategy. Opportunities should be made available for people in community who do not normally have access, for whatever reason, to be given access; for example, mobile internet services to regional or remote communities. This should be more than just a “hit and run” access or one off classes; as these do not allow the opportunity to steadily build on the skills being acquired. Enactive attainment required frequent successful use of the technology. Similarly, greater self efficacy beliefs can be increased through verbal persuasion about performance. But this persuasion must be delivered by competent and credible evaluators. It must also be constructive. Telling individuals that they will succeed only through hard work or that they need to work harder is likely to lower self efficacy in the long run since this message conveys that the user must have been deficient to begin with to require such hard work to succeed. The use of these four sources of self efficacy may require that staff involved in designing, delivering and supporting the information and ICT needs of community may required addition training to be able to adequately undertake their duties. It will inevitably require support from policy makers at the most senior levels; and it will need greater budgetary assistance.

LIMITATIONS OF THE RESEARCH

The research has several possible limitations that must be considered. First the research employed cross sectional data to identify the significant relationships between the research variables. Consequently, no firm conclusions can be made regarding the exact magnitude of the causal effects. Longitudinal designs, although much more difficult to achieve (especially in the community setting), are crucial for furthering current understanding of the nature of the digital divide. A second weakness is the researcher’s reliance upon the use of self-reported measures by participants. Self reported measures provide a useful opportunity to collect data otherwise not readily available. But self reported data is limited by what “individuals know about their attitudes and are willing to relate” (Nunnally, 1967: 590). As such a significant potential limitation in the current study is the overall validity of the measures employed. Thirdly it is acknowledged that the validity and reliability of a construct cannot be established by a single study. The internet self efficacy measure developed for the purpose of this research requires further testing and revising in order to improve its psychometric properties. Finally, some caution must be taken when interpreting the findings in relation to the broader Brisbane community and the Queensland population. This is because the participants were recruited from a small catchment (i.e. only one city in Queensland, and, via only a limited number of suburbs and contexts within that city). Thus, what is presented here is a picture of the digital divide as understood by one “small world” and more specifically by only a very small per cent age of members from this small world. The existing picture can be deepened through replication.

RECOMMENDATIONS AND FUTURE DIRECTIONS

Any worthy research topic is likely to provide more questions than can actually be resolved during the immediate research activities, and this is the case here. Recommendations for future research and practice from this research include:

- That the present study be replicated in other community contexts in Queensland and Australia This will help determine whether the findings uncovered in this study are present in other parts of the state and the nation.
- That the present study be replicated in communities in other cultures. This will help to determine if the findings of this study are also found in other cultural contexts. This is of particular importance for the developing nations and consequently the “global digital divide”.
- That further studies be conducted to explore in greater detail the factors that influence the formation of self efficacy beliefs. Whilst, the current research has shed some initial light on this point, and there is a wealth of information in the SCT literature itself, further studies would help establish what the key factors are for this particular phenomenon which must be used in supporting community.
- That further studies be conducted exploring self efficacy and digital inequality with other ICTs. This study has focused on the internet for the reasons that at the moment it is the accepted “face” of digital inequality but each day new technology and new developments arise impacting upon people’s information worlds. Extending the

research to incorporate these new developments will help to shed more light on the phenomenon.

- That further studies are conducted that use a longitudinal approach to study the phenomenon. These studies should also incorporate exploration of intervention programs. Conducting pre and post tests based on people's experiences of intervention programs that are designed to help establish self efficacy will assist in determine the most effective strategies to take to bridge the digital divide.
- That organisations and policy makers incorporate both access to technology and programs and services aimed at helping members of community to develop their self efficacy beliefs. These programs and services should be based upon the four core sources of self efficacy noted by Bandura: enactive attainment; verbal persuasion; vicarious experience and physiological feedback. This may require additional resource or training for staff involved in the design and delivery of community based services; it may also involve the redevelopment of current infrastructure.

CONCLUSION

The aim of this research was to extend the current understanding of the digital divide by developing a theoretical framework for viewing digital inequality in community that considers socio-cognitive factors alongside socio-economic factors. An alternative perspective for understanding digital divide has been proposed. The research has shown that socio-cognitive factors, and self efficacy is particular, is the major predictor of internet use in community. The digital divide is not about computers, modems, the internet and hardware. It is about people. As such the key to solving the issue of digital inequality is not going to be found with corporate or government funds and resources providing physical access to technology. Instead the key to solving digital inequality is inside the individual user. We need to develop programs and services that support the individual. Access alone is not the answer. Whilst access is certainly a good starting point; it is most certainly not the end point. This alternative formulation of the digital divide presented in this research is by no means intended to minimise the role played by socio-economic factors. Indeed the socio-economic perspective has helped shed light on a very real social issue. What this research does is suggest that the digital divide is simply more complex more involved then we have imagined, and that further and different research is required if genuine insight and real steps are going to be made in establishing an information society for all.

ACKNOWLEDGEMENTS

The author would like to acknowledge the support and contributions to this project from the staff at the Brisbane City Council Library service, the Accor Hotel group and the assistance of Helen Hall, Tracy Creagh and Julanne Neal in helping with the data collection. The author would like to acknowledge the comments and advice by Christine Bruce, Sylvia Edwards, Taizan Chan, Rebecca Spooner-Lane and Clive Bean. But most important the author would like to acknowledge and thank the people of Brisbane who generously donated their time to participate in the research.

NOTES

1. 'Smart State' is a quote from Queensland the Smart State [HREF2].
2. Non response error between the complete and incomplete surveys was examined using Chi-Square test of independence and one way ANOVA. The analysis revealed that the surveys were not statistically significant in terms of age, gender, income, ethnicity, disability and internet use. Initial analysis revealed a statistically significant difference between the surveys in regards to highest education and employment status, however further analysis suggests that whilst there is a difference this difference was small and most likely not significant in practice.
3. The next census took place in 2006 but data will not be available for use until 2007.

REFERENCES

Bandura, A. (1986). *Social foundations of thought and action: a social cognitive theory*. Englewood Cliffs, N.J.: Prentice-Hall.

Bandura, A. (2005). Guide for creating self efficacy scales. In F. Pajares & T. Urdan (Eds.) *Self efficacy beliefs of adolescents* (pp. 301-338). Greenwich, Conn.: Information Age Publishing.

Burgelman, J. (2000). Regulating access to the information society: the need for rethinking public and universal service. *New Media and Society*, 2(1), 51-66.

Cooper, D. R. & Emory, W. (1995) *Business research methods*. Chicago: Irwin.

Cuneo, C. (2002). *Globalised and localised digital divides along the information highway: a fragile synthesis across bridges, ramps, cloverleaves and ladders*. Available online [HREF3] Retrieved 29 June, 2006.

Eastin, M. S., & LaRose, R. (2000). Internet self efficacy and the psychology of the digital divide. *Journal of Computer Mediated Communication*, 6(1). Available online [HREF4] Retrieved, 25 July, 2005.

Foster, J. J. I. (2001). *Self-efficacy, African-American youth, and technology: Why the belief that "I cannot do that" is driving the digital divide*. Unpublished PhD, University of Alabama, Tuscaloosa.

Foster, S. P. (2000) The digital divide: some reflections. *International Information and Library Review*, 23, 437-451.

Frissen, V. A. (2000) ICTs in the rush hour of life. *The Information Society*, 16(1), 65-75.

Harper, V. B. (n.d.). *Digital divide (DD): redirecting the efforts of the scholarly community*. Available online [HREF5] Retrieved 11 August, 2005.

Jung, J., Qiu, J. L., & Kim, Y. (2001). Internet connectedness and inequality: beyond the digital divide. *Communication Research*, 28(4), 507-538.

Kvasny, L. (2002). *Problematizing the digital divide: cultural and social reproduction in a community technology initiative*. Unpublished PhD, Georgia State University, Atlanta.

Lam, J., & Lee, M. (2005). *Bridging the digital divide - the roles of internet self efficacy towards learning comuter and the internet among elderly in Hong Kong, China*. Paper presented at the Proceedings of the 38th Annual Hawaii International Conference on System Sciences (HICSS), Hawaii. 3-6 January 2005.

LaRose R., Mastro, D., & Eastin, M. S. (2001). Understanding internet usage: a social cognitive approach to understanding usage and gratifications. *Social Science Computer Review*, 19(4), 395-413.

Lenhart, A., Horrigan, J. B., Rainie, L., Boyce, A., Madden, M., & O'Grady, E. (2003). The ever shifting internet population: a new look at internet access and the digital divide. Available online [HREF6] Retrieved, 11 May, 2005.

Mossberger, K., Tolbert, C. J., & Stansbury, M. (2003). *Virtual inequality: beyond the digital divide*. Washington, D.C: Georgetown University Press.

National Office for Information Economy. (2002). The Current State of Play: National Office for Information Economy (NOIE). Available online [HREF7] Retrieved, 14 May, 2005.

National Office for the Information Economy. (2005). *Current State of Play*: National Office for the Information Economy (NOIE). Available online [HREF8] Retrieved, 20 July, 2006.

National Telecommunications and Information Administration. (1995). *Falling through the net*. A Survey of the "Have Nots" in Rural and Urban America: NationalTelecommunications and Information Administration (NTIA). Available online [HREF9] Retrieved 18 May, 2005.

National Telecommunications and Information Administration. (2000). *Falling through the net: towards digital inclusion*: National Telecommunications and Information Administration (NTIA). Available online [HREF10] Retrieved, 18 May, 2005.

Neice, D. C. (1998) *Measures of participation in the digital techno-structure: internet access* (No. 44). Brighton: SPRU.

Netemeyer, R. G., Bearden, W. O. & Sharma, S. (2003) *Scaling procedures: issues and applications*. Thousand Oaks: Sage Publications.

Nunnally, J. C. (1967). *Psychometric theory*. New York: McGraw Hill.

Ringgold, R. L. (2001). *The evaluation of computer attitudes and the validation of computer self efficacy scales of minority students at an urban community college in Baltimore City, Maryland*. Unpublished PhD, Morgan State University, Baltimore, Maryland.

Selwyn, N. (2004). Reconsidering political and popular understandings of the digital divide. *New Media and Society*, 6(3), 341-362.

Van Dijk, J. (2005). *The deepening divide: inequality in the information society*. London: Sage Publications.

HYPERTEXT REFERENCES

HREF1
http://www.stiu.fit.qut.edu.au/people/partridge.jsp
HREF2
http://www.smartstate.qld.gov.au/
HREF3
http://socserv2.mcmaster.ca/sociology/Digital-Divide-Sorokin-4.pdf
HREF4
http://jcmc.indiana.edu/vol6/issue1/eastin.html
HREF5
http://cal.csusb.edu/cmcrp/documents/Digital%20Divide%20position%20paper1(hypertext%20version).doc
HREF6
http://www.pewinternet.org/pdfs/PIP_Shifting_Net_Pop_Report.pdf
HREF7
http://www.agimo.gov.au/media/2002/04/17194.html
HREF8
http://www.dcita.gov.au/__data/assets/pdf_file/33120/Current_State_of_Play_-_November_2005.pdf
HREF9
http://www.ntia.doc.gov/ntiahome/fallingthru.html
HREF10
http://search.ntia.doc.gov/pdf/fttn00.pdf